

1964: Pioneering Work on Lasers and Masers



Charles H. Townes



Aleksandr M.
Prokhorov



Nicolay G.
Basov

History

1917: Theoretical foundation for laser and maser established by Einstein

1928: Existence of stimulated emission and negative absorption confirmed by Rudolf Ladenburg

1939: Use of stimulated emission to amplify “short” waves predicted by Valentin Fabrikant

1947: Willis Lamb and R.C. Retherford find evidence for first demonstration of stimulated emission in hydrogen spectra

1950: Optical pumping proposed by Alfred Kastler

1951: Charles Townes conceives idea of first maser: **Microwave Amplification by Stimulated Emission of Radiation**

1954: Townes creates the world’s first ammonia maser at Columbia University

1955: Basov and Prochorov propose method for production of pumping method, later a main method of laser pumping

1955: Prochorov studies ruby spectra; makes it possible for suggested use as suitable laser material.

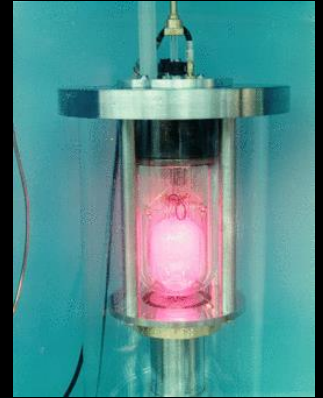
1958: Townes theoretically shows that masers can operate in both the optical and infrared spectra

1960: First functional laser operated by Theodore Maiman

1964: Townes, Prokhorov and Basov receive Nobel Prize in Physics for “fundamental work in the field of quantum electronics, which led to the construction of oscillators and amplifiers based on the maser-laser principle”



Townes with first maser



Hydrogen maser

Applications

- **Industrial:** Cutting, welding, non-contact measurement, heat treatment, laser-leveling, engraving
- **Medical:** Laser eye surgery, dentistry, bloodless surgery

- **Military:** Rangefinders, munitions guidance, missile defense, radar alternative
- **Scientific:** Spectroscopy, interferometry, fluorescence microscopy, scattering, atomic frequency standard (atomic clock)

- **Commercial:** barcode scanners, optical disc readers, thermometers, laser pointers